Providing Solutions in
Pressure-Sensitive Films

FLEXCON

WHITE PAPER

The Adhesive Alternative and Advantage:

From Vibration and Noise Damping to Minimizing Corrosion, Pressure-Sensitive Adhesives are a Viable, Cost-Effective and Innovative Alternative to Mechanical Fasteners

Along with noise and vibration damping, original equipment manufacturers are always looking for faster and better ways to make cars and vehicle subcomponents, while reducing weight and decreasing costs.

Historically, mechanical fasteners and welding were very much a part of the assembly process, adding weight and diminishing fuel-efficiency. Long before the "Cash for Clunkers" initiative to get gas guzzlers off the road, automakers were striving to produce lighter, more fuel efficient cars.

Manufacturers did this with approximately 70 pounds of adhesive products that replaced more than 200 pounds of mechanical fasteners.

The automobile industry, however, is not the only trade taking advantage of the value that PSAs offer. This versatile technology is also used in the manufacturing of appliances, electronics, outdoor power equipment, aerospace components and a myriad of other products.

PSAs have long been used to dampen brake noise and vibration.

The Adhesive Advantage

Design engineers specify PSAs to assemble washers, dryers, cellular telephones, lawn tractors, satellites, power tools, and more.

There are many reasons PSAs are considered an alternative or better solution to traditional methods for joining parts, such as screws, nuts, bolts, rivets, welds and other mechanical fasteners. The most obvious benefits are reduced material, labor and processing costs; ease of use; and perhaps even easier disassembly of parts, if necessary.

PSAs distribute an even stress load over a given area, reducing stress on joints, resisting flex and vibration stresses, and forming both a seal and a bond to protect from corrosion. These materials can fill large gaps, join irregular-shaped surfaces, and quickly and easily bond dissimilar substrates and heat-sensitive materials. PSAs minimally increase the weight of an assembly and create virtually no change in part dimensions or geometry. A manufacturer can easily integrate PSAs into an operation to achieve the durability and aesthetics that end products need. Moreover, adhesives remain viscous throughout their life. That viscosity imparts sound and vibration damping properties in addition to being a fastening or joining solution.

Design engineers specify PSAs to assemble washers, dryers, cellular telephones, lawn tractors, satellites, power tools and more.

Mechanical devices, from power tools, to computer hard drives, to industrial furnaces, generate noise and vibration, which can manifest into equipment failure. Acrylic and silicone double-faced PSA products sandwiched between substrates silence noise and eliminate vibration, while withstanding extreme heat and chemical exposure. Additionally, gaskets and seals that have an adhesive layer are easier to affix and assemble, reducing production time.

Incompatible surfaces, like two metals that would normally abrade and corrode when in contact, can be protected and joined with PSAs. Such a barrier, for example, is a very important component in automotive safety systems that require high-performance seals. Adhesive and pressure-sensitive film suppliers have met the many challenges of evolving automotive technologies. These applications include bonding attachment clips for interior panels, air bags, and lamp assemblies, to name a few. The trend toward better safety has advanced PSA importance. With more vehicles being equipped with side-impact protection air bags and curtains for rollover protection, high-performance substrates consisting of film-to-fabric adhesive laminations are becoming more popular.

PSAs are used by practically every industry, and whether it is an off-the-shelf or custom-made product, these polymeric technologies can meet aerospace, medical, and security requirements; form bonds in sub-zero cold temperatures and to low-surface energy (LSE) substrates; maintain adhesion at temperatures in excess of 500°F; resist "out gassing;" respond to low frequency AC; resist dielectric breakdown; act as a thermal insulator, or facilitate heat transfer; and survive the strict requirements for loss of coolant accidents in nuclear reactors.

PSAs Weather Appliance Environment

Today's appliances are a marvel of design ingenuity and high-tech capability. They are also platforms that demonstrate the versatility of pressure-sensitive films and adhesives, which are found on, under and within appliances, such as washers and dryers, meeting both aesthetic and functional requirements.

PSAs provide long-term stability for membrane switches and foam gaskets.

For example, there's more to the nameplate on the washing machine than just the name. Not only does it need to capture the eye of the consumer, but it also needs to stand up to vibration, moisture, heat, cold, soap, grease and bleach.

Combined with a polyester material for durability and printability, a permanent acrylic adhesive assures that the nameplate stays intact, legible and vibrant for the life of the appliance, which is often 10 years or more. This same polymeric material combination is also used for warning, safety, electrical rating, operating

instructions, warranty details, UL recognition, and other essential consumer information labels. Adhesive failure of any one or more of these labeling components not only projects poor quality, but it also puts an OEM at risk of liability, if say, a safety or warning label fails.

Moreover, pressure-sensitive materials often constitute key elements of an appliance's inner workings and performance. Gaskets formed with PSAs, for example, provide water-tight seals. High-performance PSAs, like silicone, have superior functionality in temperature extremes and bond to adhesion challenging surfaces like powder-coated paint and LSE plastics like thermoplastic polyolefin (TPO). These same adhesives are used to hold foam firmly in place in areas that must be opened and closed repeatedly, such as the appliance door or panel. The foam's rebound characteristic, along with the adhesive's strength to keep it in place, enhances the appliance's performance.

At the same time, layers of viscoelastic polymers between layers of steel or plastic naturally impart vibration and noise damping, which meets the consumer demand for appliances that whisper rather than rumble.

Anti-Adhesion Arrestor

Adhesives play a big part in the manufacturing of cars, trucks, buses, and many other types of vehicles.

Practically any vehicle component can be bonded using PSAs. Along with the cost savings of replacing mechanical fasteners, PSAs allow incompatible materials to be bonded. This is critical since the components of a typical vehicle are a mix of lightweight construction materials, where bonding would not be possible without adhesives.

PSAs also provide gasketing, which is also important to transportation industries, especially in mass transit applications, where fire prevention and heat protection are required. For example, tacky silicone adhesives are used to bond protective padding between surfaces. Pads that are attached with PSAs are less likely to be damaged by movement than those attached with mechanical fasteners. Such padding also restricts the spread of heat and flame and also offers sound and vibration damping between surfaces.

Perhaps the biggest PSA contribution to the automotive and transportation industries is the ability to overcome adhesion challenges posed by LSE plastics without pre-application priming or flame treatment.

Along with TPO, many low-surface energy plastics, including polypropylene, polyethylene, and Teflon®* are cost-effective choices among OEM design and production engineers for a host of vehicle components. These cost-saving substrates, however, have an inherent molecular structure that poses adhesion and printing process challenges for converters.

These issues are rectified with PSAs. In collaboration with LyondellBasell Advanced Polyolefins, one of the world's largest producers of polymers, petrochemicals and fuels, FLEXcon tested its V-778, a highly aggressive, acrylic PSA, on a wide range of TPOs and polyolefin alloy materials.

Lyondell Basell found the adhesive to exhibit excellent adhesion and durability and cleared a sales roadblock for their customers who did not want to spec its TPO plastics because of adhesion problems it posed on the assembly line. V-778 is also an appropriate choice for gasketing and sealing products to surfaces that are resistant to adhesion. V-778 can be used as an assembly aid during the attachment process in manufacturing. Further, it provides sealing properties when bonding two low surface energy plastics or other smooth products together.

Outdoor power equipment as well as all terrain and recreational vehicle manufacturers, for example, can use a permanent, pressure-sensitive acrylic adhesive to attach thermoformed TPO parts to the equipment or to decorate or accessorize an ATV once it has been assembled. In fact, one outdoor power equipment OEM used a PSA to attach an abrasion-resistant panel to a vehicle door to minimize scratching as it moves through heavily forested areas. PSAs are also ideal when attaching an aluminum nameplate to a steel surface, two otherwise incompatible surfaces.

PSAs can certainly enhance product performance. When considering application-specific polymeric materials, OEMs, design engineers and converters can benefit greatly by consulting an adhesive and pressure-sensitive film supplier at the earliest stages of product design. Doing so will make cost-effective solutions more likely. Early collaboration can assure an optimum match between the adhesive's damping characteristics and the specific frequency and temperature range that must be achieved to eliminate unwanted noise and vibration. Moreover, partnering with a supplier also minimizes potential time-to-market, durability and aesthetic issues.

About the Author

Shirley Monte is a Business Development Manager for the Performance Products Business Team. Reach her at (508) 826-4646 or smonte@flexcon.com.

About FLEXcon

FLEXcon is an ISO 9001:2008 worldwide manufacturer of pressure-sensitive films and adhesives for applications including indoor and outdoor advertising, bonding/mounting, and product identification, safety, hazard, bar-coded, and primary labels. The company's Value-Better-Supreme (VBS) product offering is the most extensive standard product offering in the pressure-sensitive film industry. FLEXcon is also a leader in developing custom solutions to meet unique converting or application needs. FLEXcon's mission is to provide its customers the highest quality products with exceptional service. The company is headquartered in Spencer, Massachusetts, and has operations throughout North America and Europe, with distribution worldwide. For more information on FLEXcon, visit www.FLEXcon.com.

Let's Talk Solutions

Bring your challenges or next big idea to FLEXcon and we will work together to find a solution. Call us at (508) 885-8200 or visit our website at www.FLEXcon.com.

Corporate Headquarters

1 FLEXcon Industrial Park
Spencer, MA 01562-2642 USA
Telephone (508) 885-8200
FAX (508) 885-8400
www.FLEXcon.com

Performance Products Business Team
Telephone (508) 885-8440
FAX (508) 885-8355

Product Branding Business Team
Telephone (508) 885-8370
FAX (508) 885-8399

Product Identification Business Team
Telephone (508) 885-8300
FAX (508) 885-8301

Manufacturing, Distribution & Sales Centers

North America

FLEXcon Spencer, Massachusetts
1 FLEXcon Industrial Park
Spencer, MA 01562-2642
Telephone (508) 885-8200
FAX (508) 885-8400
FLEXexpress FAX: 1-800-428-4505

FLEXcon Columbus, Nebraska
2021 E. 23rd Street
Columbus, NE 68601
Telephone (402) 562-6131
FAX (402) 562-6054

Europe

FLEXcon Europe Ltd.
Whitworth Road
Southfield Industrial Estate
Glenrothes, Fife KY6 2TF
Scotland - UK
Telephone +44(0) 1592 663200
FAX +44(0) 1592 663201
europeinfo@FLEXcon.com

Sales Offices

North America

FLEXcon Pennsylvania
Routes 1 & 202
The Weichert Building, Suite 260
P.O. Box 156
Chadds Ford, PA 19317
Telephone (610) 358-2571
FAX (610) 358-5946

FLEXcon Kansas
1305 South Fountain Drive
Olathe, KS 66061
Telephone (913) 768-8669
FAX (913) 894-5129
FLEXexpress FAX: 1-800-732-4329

Distribution & Sales Facilities

North America

FLEXcon California
12840 Reservoir Street
Chino, CA 91710-2952
Telephone (909) 465-0408
FAX (909) 627-4136
FLEXexpress FAX: 1-800-446-4136

FLEXcon Ontario
1020 Lorimar Drive
Mississauga, Ontario L5S 1R8
Canada
Telephone (905) 795-5509
FAX (905) 795-8984
FLEXexpress FAX: 1-800-563-9143

Europe

FLEXcon Europe Ltd.
Flevolaan 3
1382 JX WEESP
P.O. Box 131
1380 AC WEESP
The Netherlands
Telephone +31(0) 294 491800
FAX +31(0) 294 430887
europeinfo@FLEXcon.com

Latin America, Asia-Pacific, Africa and Middle East

FLEXcon International
Sales Office
1 FLEXcon Industrial Park
Spencer, MA 01562-2642
Telephone (508) 885-8223
FAX (508) 885-8355